



April 23, 2020

Notice of Ex Parte

Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street SW
Washington, DC 20554

Re: Protecting Against National Security Threats to the Communications Supply Chain
Through FCC Programs, WC Docket No. 18-89

Dear Ms. Dortch,

On April 21, representatives of Ericsson met by video conference with staff from the Commission's Wireline Competition Bureau to discuss matters relating to replacement of non-trusted equipment in U.S. operators' networks. Representing Ericsson were Anand Akundi, Bill Chotiner, Charles Hamby, Scot Harris, Barry McLaren, Gheorghe Spiride, Loris Zaia, and Jared Carlson. The Wireline Bureau staff on the call were Benjamin Goodwin, Brian Cruikshank, Charlene Goldfield, Justin Faulb, Pam Arluk, and Ryan Palmer. The presentation that was used on the call is appended to this *ex parte* letter.

Gheorghe Spiride provided an overview of the Ericsson's customers who are potentially eligible for assistance in swapping out network equipment. It is a diverse set of companies, serving communities totalling 60 Million users.

Bill Chotiner then provided an overview of Ericsson's hardware, with a focus on what equipment rural operators would likely use when swapping out portions of their infrastructure. He also described different models for swapping equipment based on the size of the operator and potential complicating factors, *e.g.*, towers which are leased and shared with other operators. He also described at a high level Ericsson's general Radio Access Network ("RAN") lifecycle, highlighting that all Ericsson radios introduced since 2015 are software upgradeable to 5G NR.

Mr. Chotiner also discussed Ericsson's involvement in open standards generally and Open Radio Access Network ("O-RAN") technology more specifically. Ericsson is an O-RAN supporter, serving as co-chair of two O-RAN Alliance working groups, and the editor of multiple technical specifications. O-RAN brings opportunities including RAN programmability, software/hardware disaggregation, and open interfaces to enable more flexibility. At the same time, however, it requires adaptation for smaller operators, requiring evolution in areas including system integration, key performance indicator assurance, and addressing increased operational complexities. Additionally, off-the-shelf hardware cannot presently achieve the same performance/cost-level ratio as high-performing telecom network equipment.



Barry McLaren described three different swap methodologies: site-by-site, sector-by-sector, and building a parallel center of radiation (“RAD center”) on a tower. Each option varies in complexity, customer impact, and cost.

Anand Akundi described Ericsson’s dual-mode 5G Cloud Core and how it allows operators to simultaneously support both 4G LTE and 5G. Ericsson’s Cloud Core leverages software containers and microservice architecture to be completely platform agnostic: the core can be run on an operator’s private cloud computing architecture or a public cloud.

Finally, Bill Chotiner wrapped up the presentation outlining Ericsson’s holistic approach to network security. He also described the growth of fixed wireless access and how many of the network swaps Ericsson has already performed have some fixed wireless services incorporated into their networks.

Ericsson appreciates the difficult task ahead of the Commission. Our technical experts stand ready to aid the Commission as it considers the myriad issues associated with assisting U.S. operators as they swap out equipment from companies deemed to pose a heightened national security risk.

Respectfully submitted,

/s/ Jared M. Carlson

Jared M. Carlson

Vice President,

Government Affairs and Public Policy

Ericsson

FCC Meeting

Ericsson Support Towards
Protecting Against National Security
Threats To The Communications
Supply Chain

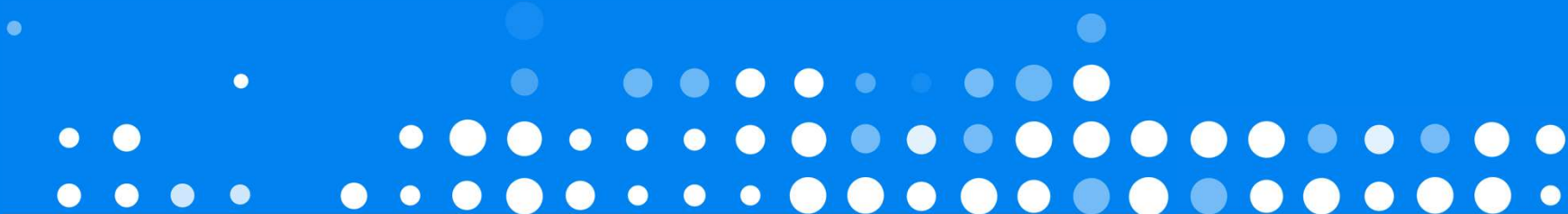
April 21, 2020



Agenda

Regional Connect 

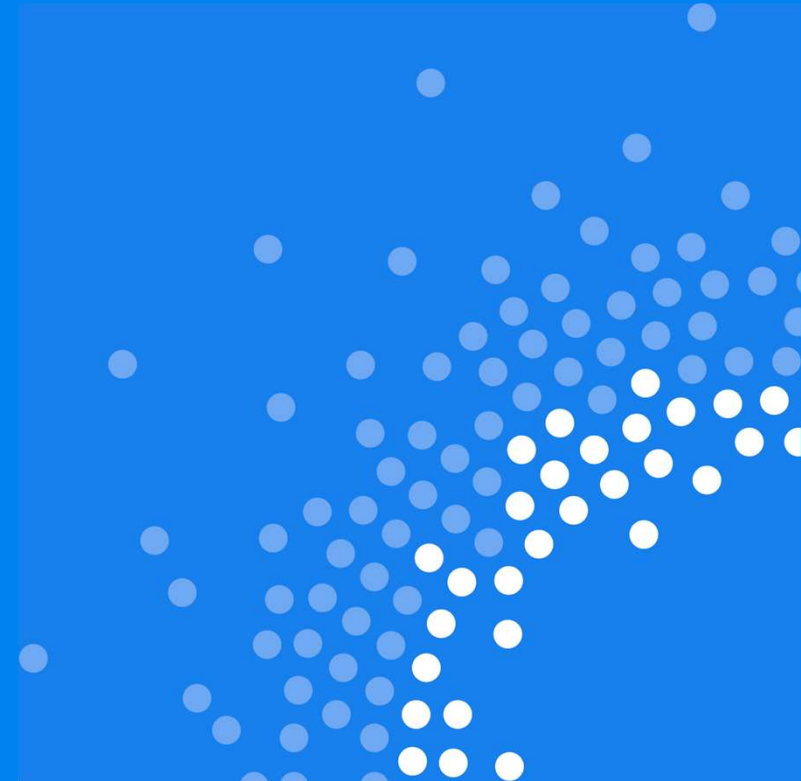
- Who Is Ericsson Customer Unit - Regional Carriers
- RAN Solutions & Services
- ORAN
- Core Solutions
- Security In Wireless Networks
- Fixed Wireless Access





Regional Connect

The power of community.



Ericsson Regional Carriers Customer Unit

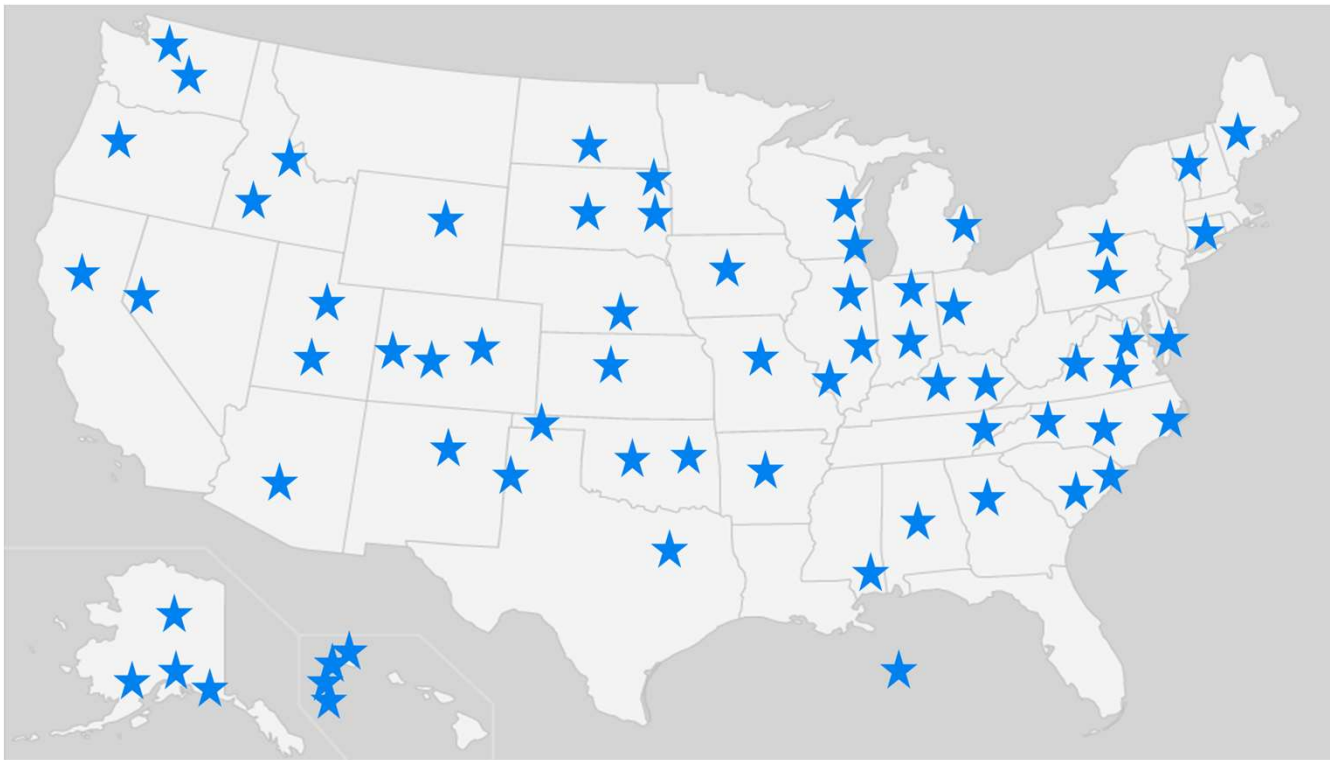
Regional **Connect** 

- Dedicated entirely to U.S.-based Tier 2 and Tier 3 carriers
- Serves over 100 Tier 3 regional operators
- Support staff includes more than 450 full time equivalents
- Ericsson Regional Connect community
 - Community of Tier 3 Ericsson customers
 - Mission is to “Connect. Share. Serve” our customers and the communities they operate in
 - Enables regular communication and collaboration between the operators
 - Provides best practices, case studies and industry information on a regular basis
 - Holds in-person and virtual meetings to exchange information and ideas with key operator representatives



Ericsson has customers across the country

Regional Connect 



Customers include:

- U.S. Cellular
- Tier 3 wireless operators
- Tier 2/3 wireline companies
- Utilities
- Government
- Working with operators to rip and replace Chinese equipment

Ericsson's key investments in North America

Regional Connect 

9,400 North American employees



Map Legend

- Primary Office Locations
- Research and Development Centers or Labs
- Manufacturing Facilities and Centers of Excellence

Established: 1902 in Buffalo, New York
NA headquarters: Plano, Texas
NA Net Sales: \$6.2 billion USD (FY 2019)

Pledge to America's Workers program.
Ericsson commits to creating 50,000 enhanced career opportunities for individuals in U.S. workforce over 5 years.

Ericsson North America Locations

United States	34
Canada	5
Warehouses/Field Services Offices	8
	47

Ericsson R&D Locations

Austin	Radio (BBU), ASIC design
Boston	Edge Cloud Platform
Dallas	Virtual Innovation Center
Montreal	Artificial Intelligence, Edge Cloud
Ottawa	Radio (5G)
Santa Clara	Artificial intelligence
Toronto	OSS/BSS

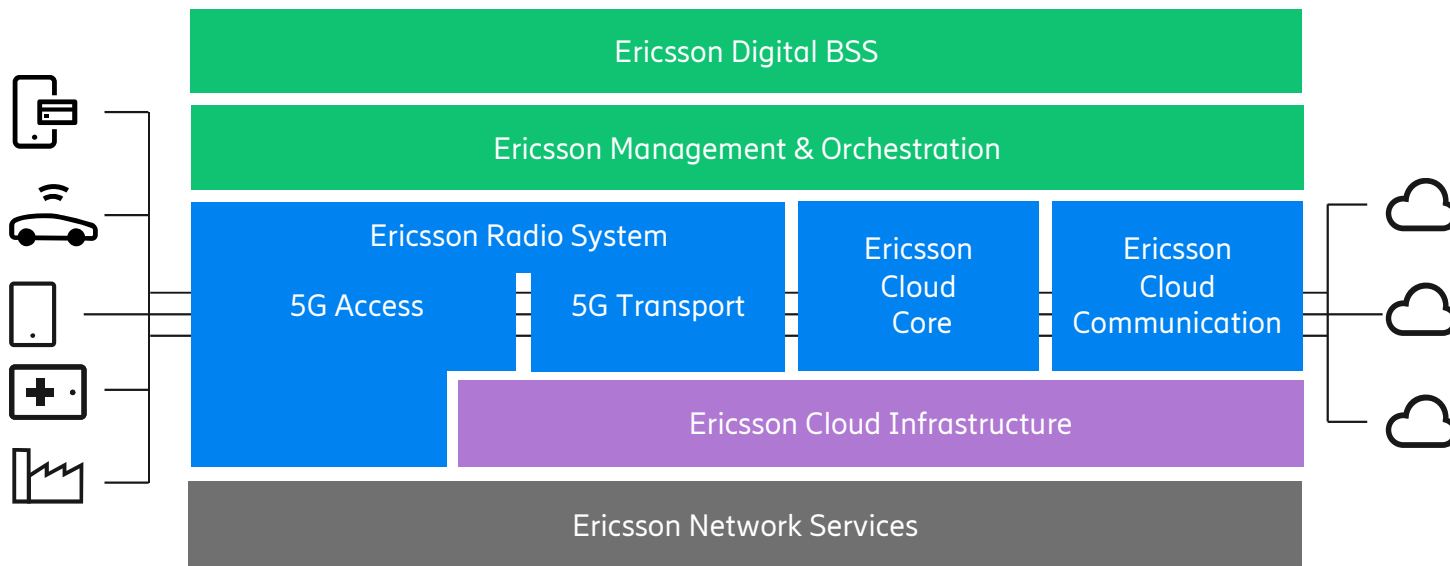


RAN Solutions & Services



5G Solution Components

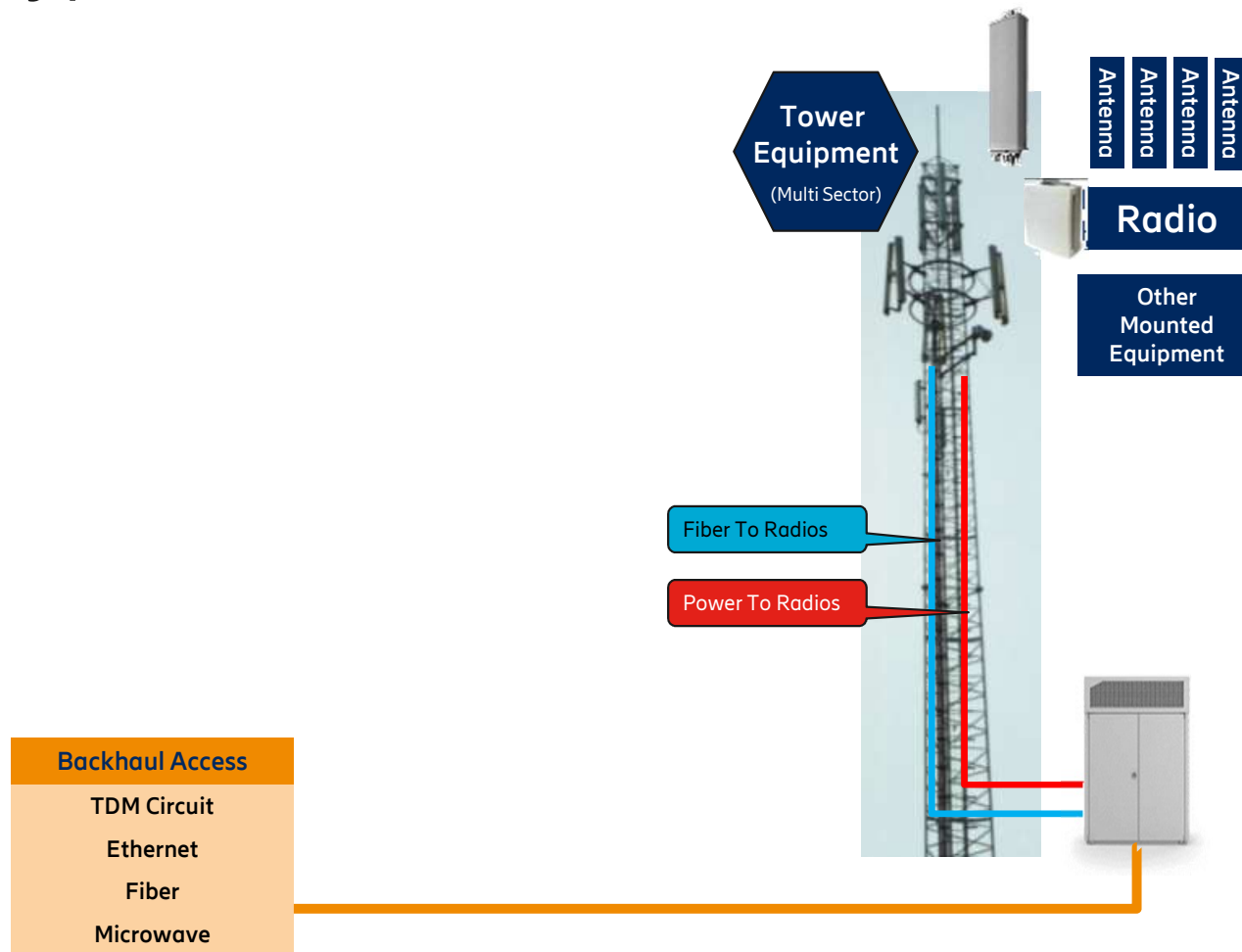
Regional **Connect** 



- **Digital BSS:**
Real-time charging and billing, digital customer engagement
- **Management & Orchestration:**
Network management, automation and orchestration of nodes, networks and capabilities
- **5G Access**
RAN Compute and baseband, radio, and site
- **5G Transport:**
Fronthaul, backhaul, edge, core
- **Cloud Core:**
Packet core, unified data management & policy
- **Cloud Communication:**
Communication services such as voice, video and messaging
- **Cloud Infrastructure:**
NFV Infrastructure for distributed cloud environments
- **Network Services**
Consulting, deployment, support, operations

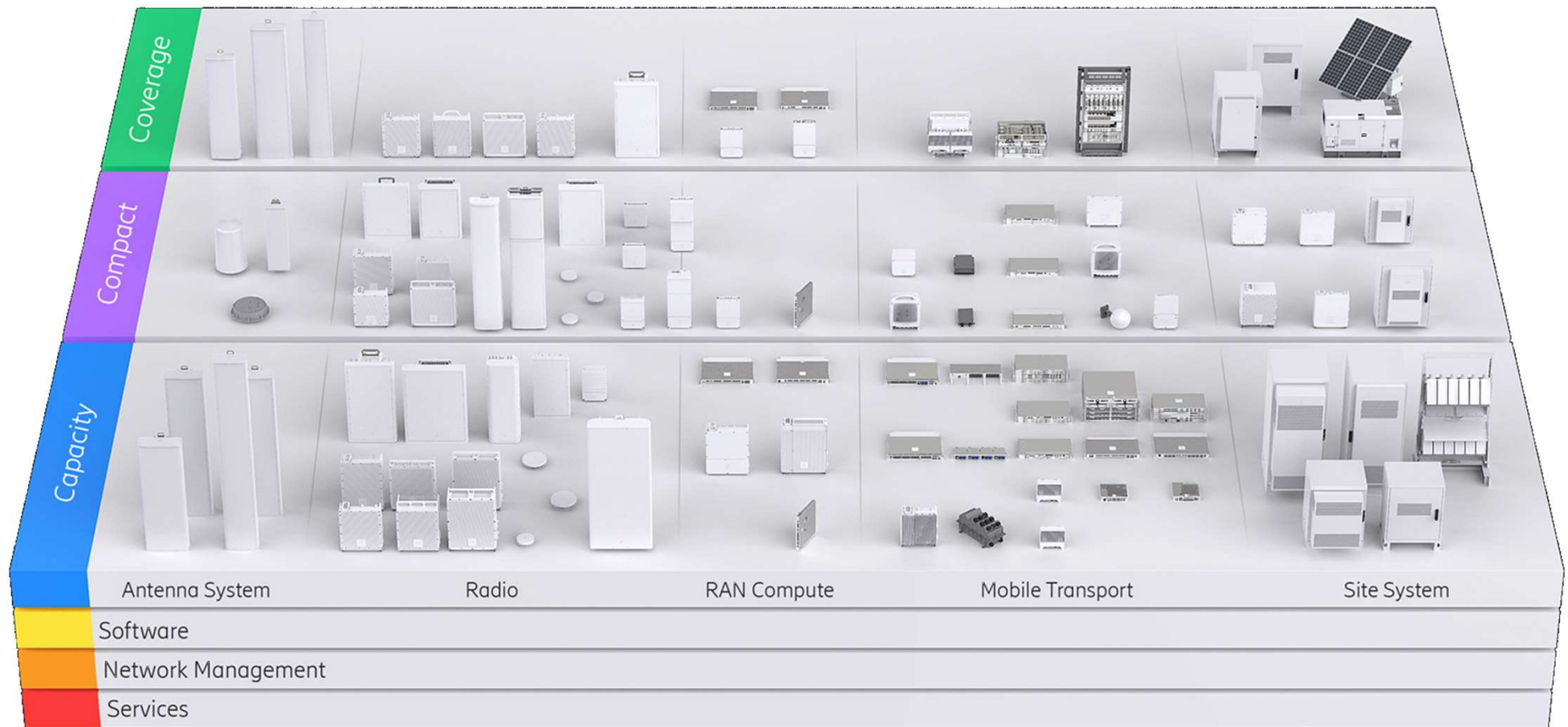
Typical Rural Cell Site

Regional Connect 



Ericsson Radio System

Regional Connect 



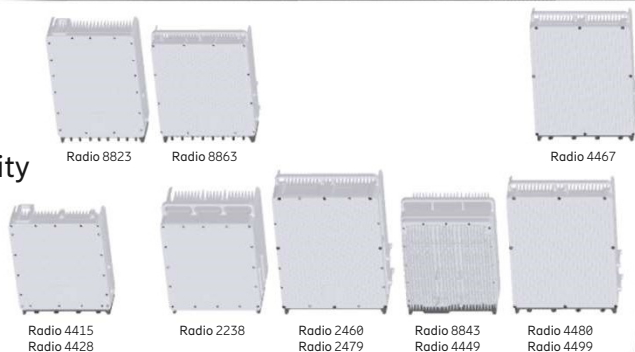
Coverage



Ericsson Radio Hardware Overview

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Capacity



Compact



Radio 4422



Macro Radio

Massive MIMO

mmWave

Micro Radio

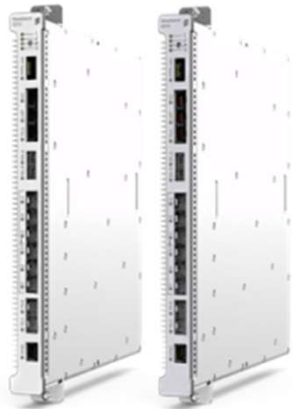
Indoor

Ericsson Radio System Baseband

RAN Compute

Regional **Connect** 

Baseband
5212 /
5216



Baseband
6318



Baseband
6303



Baseband
6620 /
6630



- High capacity
- Multi-standard
- Ready for IoT and 5G

Baseband
6502



Rural Swaps Services

Key Considerations (1/2)

Operators preference for minimizing end customer impact

More expensive and longer cycle time to minimize outages (reference swap methodology options slide)

Operators that typically self perform incremental sites will need vendor support to swap out their entire network

> 12 months for operators with large number of sites

Competing for limited resources with industry 5G modernization & merger / new entrant network upgrades

More expensive to secure and retain crews
Cycle time impact due to crew limitations & time to train

Mix of tower sites that are owned / leased and where leased often shared with other operators

Lead time required for site acquisition update, negotiations and approvals

Solution configuration - number of technologies and number of bands per technology

Extended time at site and more complex cut over for multiple bands. More space and structural considerations

Rural Swaps Services

Key Considerations (2/2)

Geographically distributed rural sites, varied roads

Extended drive times and cost for warehouse pick up / return and disposal of equipment

Limited local tower crews

Need to mobilize crews from other markets. Limited accommodation for crews close to rural sites - drive time.

Winter weather and high wind implications

Can lose up to an average of 7 working days per month in winter

Documentation and tracking / process for environmental disposal

Critical to ensure that decommissioned equipment is destroyed and disposed of in a responsible way.

Microwave backhaul required to be changed in some cases

Dependencies on process and scheduling if other customer traffic being carried

Swap Methodology Options

	Sector by Sector	Site by Site	Parallel RAD Center
Description	Turn down each sector individually while swapping equip.	Turn down entire site while swapping out equip.	Build a new location for equipment on the tower close to old
Customer impact	⊗ ⊗ ⊗	⊗ ⊗ ⊗ ⊗	⊗ ⊗
Complexity	✂ ✂ ✂ ✂	✂ ✂	✂ ✂ ✂ ✂
Swap Type	Hot	Cold, Hot	Hot
Pros	<ul style="list-style-type: none"> • Gradual, methodical replacement • Low level customer impact • Reuse existing facilities (lines, power, etc) if compatible • Hot Swap application • Less Site Acq activities are needed 	<ul style="list-style-type: none"> • Faster swap replacement; less labor costs; less Cycle Time • Reuse existing facilities (lines, power, etc) if compatible 	<ul style="list-style-type: none"> • Minimal customer impact • Hot Swap Application
Cons	<ul style="list-style-type: none"> • Cycle Time is extended; higher labor costs • May not have sufficient space on tower to effect a swap (sector frames) 	<ul style="list-style-type: none"> • Higher level of customer impact; need to have neighboring/overlapping coverage • Cold Swap application • More Site Acq activities are needed 	<ul style="list-style-type: none"> • Higher labor costs; long cycle time • Expect structural mods • Will need additional lines and new sector frames • Site Acq activities become more complex

Ericsson RAN Lifecycle

—RAN Software Lifecycle Timelines

- Generally Available (GA) SW release per quarter for each RAN technology
- SW GA to SW End Of Support (EOS) – 11 Quarters
- Backwards compatibility for 6 prior quarterly releases

—Hardware

- Radios typically supported until such time that technology deems them obsolete
- Baseband lifecycle is typically > 10 years from being introduced until end of support
 - e.g. DUS41 was introduced in October 2012 and will go end of support after 2025

Why Ericsson

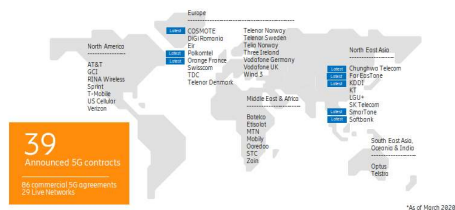
Key portfolio enablers for best performance & efficient evolution to 5G

Regional **Connect** 

5G Time to market

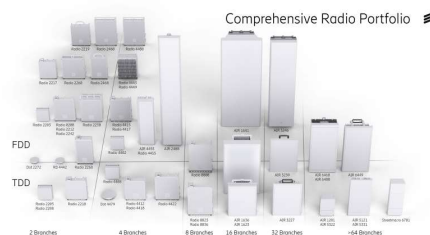
Only global vendor

5G commercialization



Broad portfolio

Build with precision



Performance

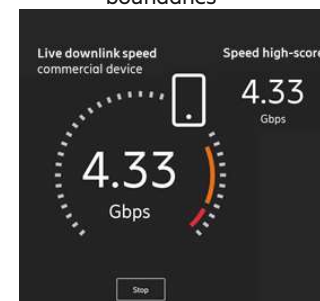
e2e design to enable best performance



M-MIMO with
UL Booster
enabled by
Ericsson LLS

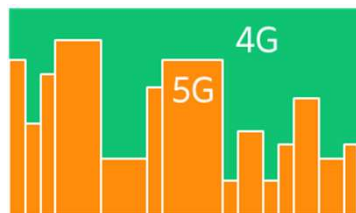
Technology Leadership

Ecosystem driver to push the technology boundaries



Ericsson Spectrum Sharing

Wide area 5G coverage quickly realized



5G Ready radios

5M radios ready for 5G



5G Ready baseband

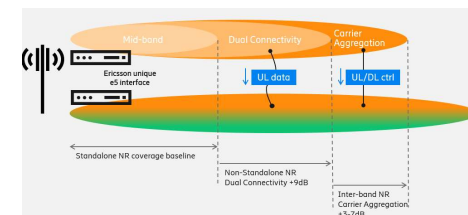
Enable 5G with SW upgrade



5G ready baseband
with E5 interconnect

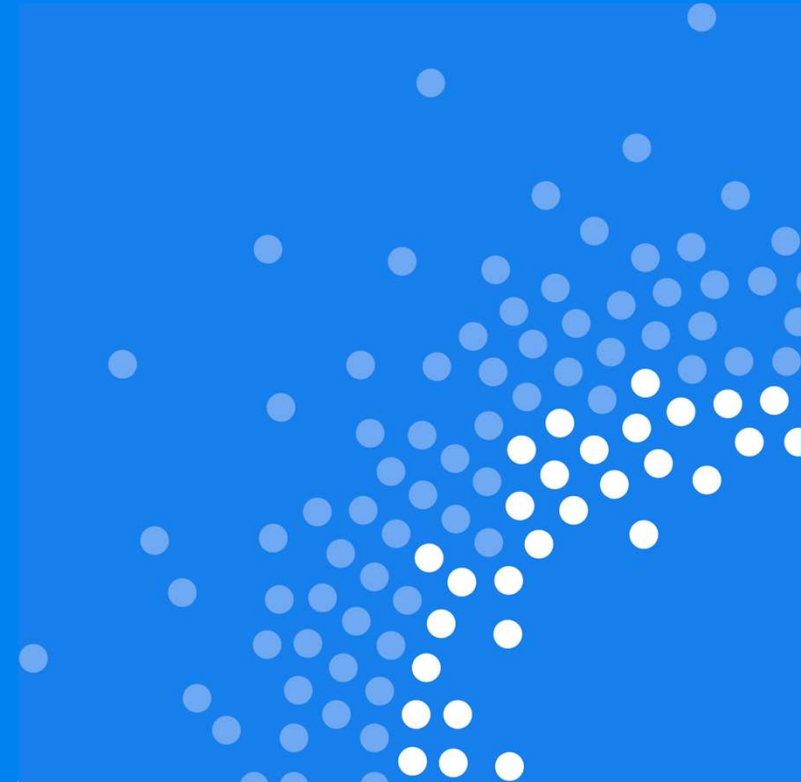
Inter-band carrier agg.

Maximize coverage and SE of TDD bands





ORAN

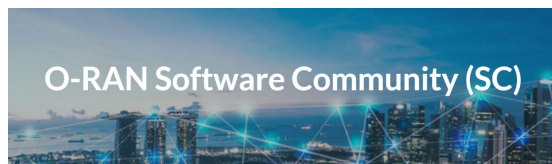


Ericsson Participation in O-RAN

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- Co-chairs:
 - WG2 and WG5
- Editors:
 - A1 Specification
 - Architecture Description
 - O2 Interface
- Key contributions:
 - A1 interface
 - Architecture Description
 - NFVi platform requirements
 - Use Cases whitepaper
 - WG5 control plane editorship



- Member of ToC (Technical oversight Committee)
- Non-RT RIC LF OSC project
 - PTL (Project Technical Lead) + 9 developers
- 'A1 Adapter' in Amber release
 - Full functionality by June, 2020



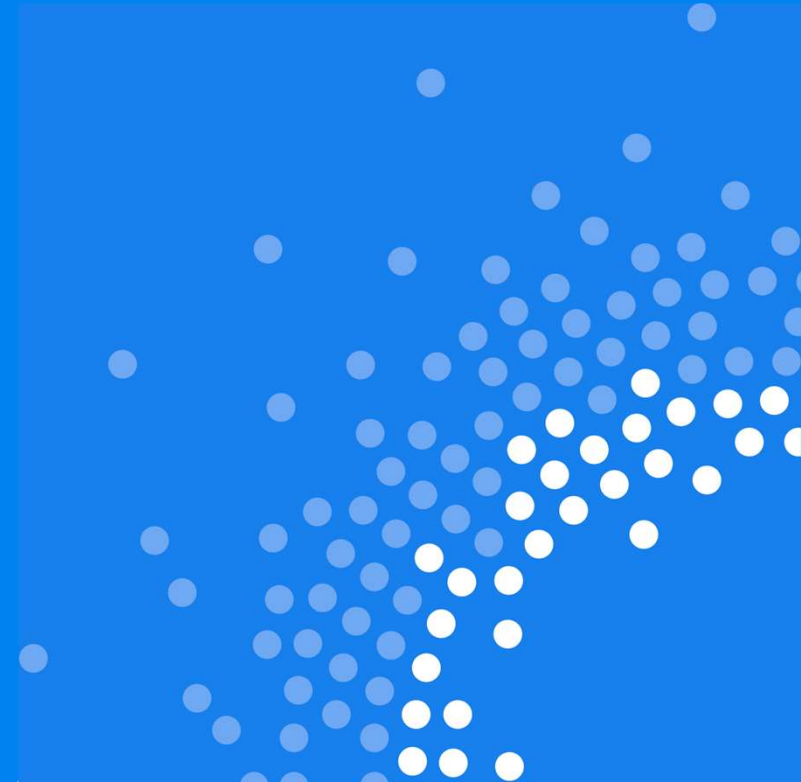
- 50+ developers
- Member of TSC
- Active participation in 5+ subcommittees
- Main code contributors in 7 projects
- 4th in overall GIT commits

Summary

- O-RAN brings opportunities like programmability towards RAN, software/hardware disaggregation and open interfaces to enable more flexibility
- O-RAN must evolve to meet smaller operators' needs
 - System Integration, KPI assurance , SLA, Accountability may result in higher TCO due to increased OPEX
 - Off the shelf hardware initially will not meet the same performance/cost ratio level that native networks achieve
- Ericsson is supportive of O-RAN
 - Ericsson is an active member and contributor to O-RAN alliance
 - Ericsson holds co-chair positions in WG2 and WG5 and editorships of various technical specifications
- Ericsson is firmly committed to bring together all relevant players and alliances in the industry to innovate at global scale

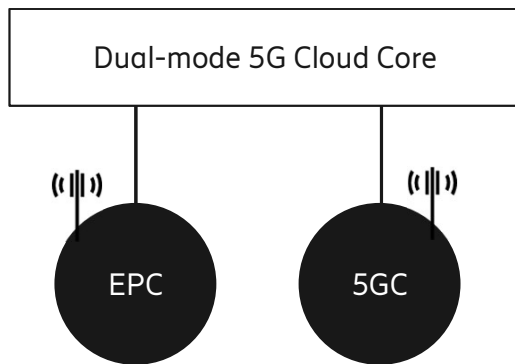


Core Solutions



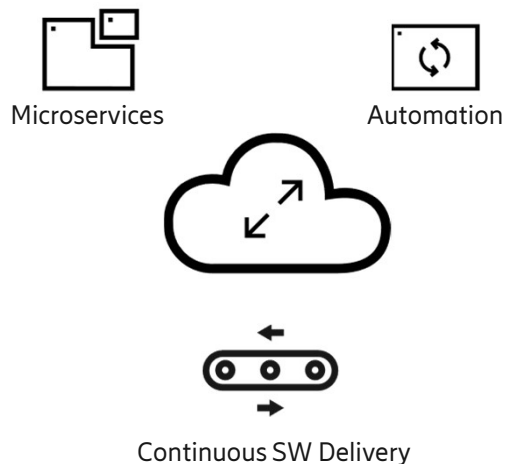
Ericsson's dual-mode 5G Cloud Core

One Core network



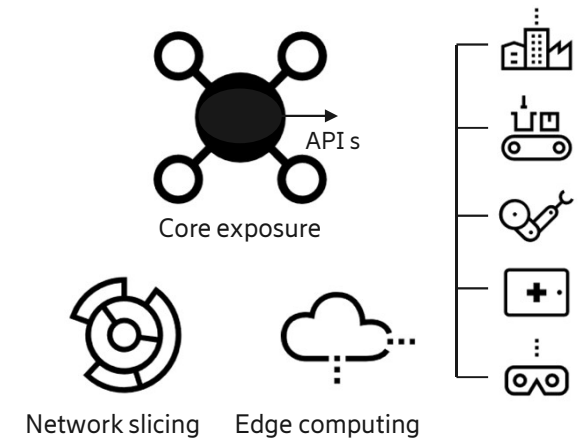
Manage growth with CAPEX efficiency

Cloud native



Reduce OPEX and operational inefficiencies

B2B opportunities



Grow revenue with agility and speed

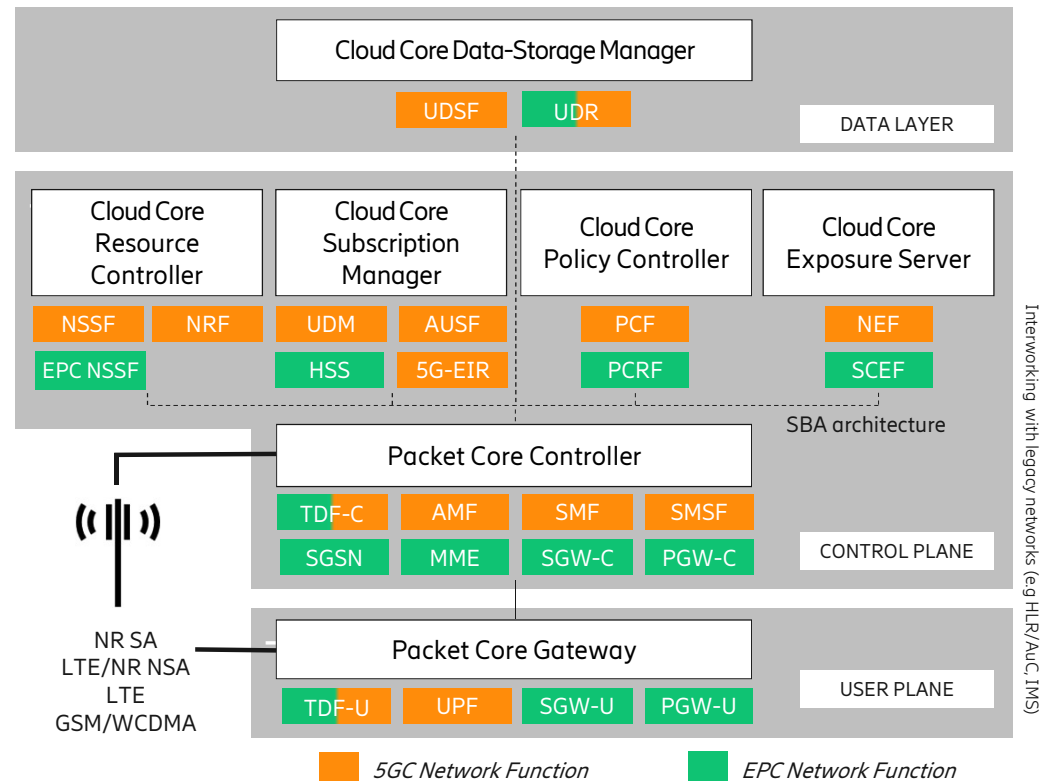
Inside Ericsson's dual-mode 5G Cloud Core

Network Functions (NF) grouped per network services, allowing deployment flexibility and a smooth evolution to 5GC

- Cloud native 5GC NFs microservice based
- Service Based Architecture (SBA)
- EPC NFs re-architected into cloud native with secured feature parity
- Fully interworking with legacy networks and NFs

SBA Benefits

- Enables more reusability
- Simpler extensibility due to light-weight SBI
- Openness / exposure without protocol conversions



Ericsson Cloud Core

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Providing LTE/5G use cases for private networks already today
Market leading EPC feature set
With pooling and load sharing for geo redundancy
OpenStack Cloud compliant, for deployment flexibility
Network slice instances with their own lifecycle and deployment

Network-in-a-box



Compact deployment



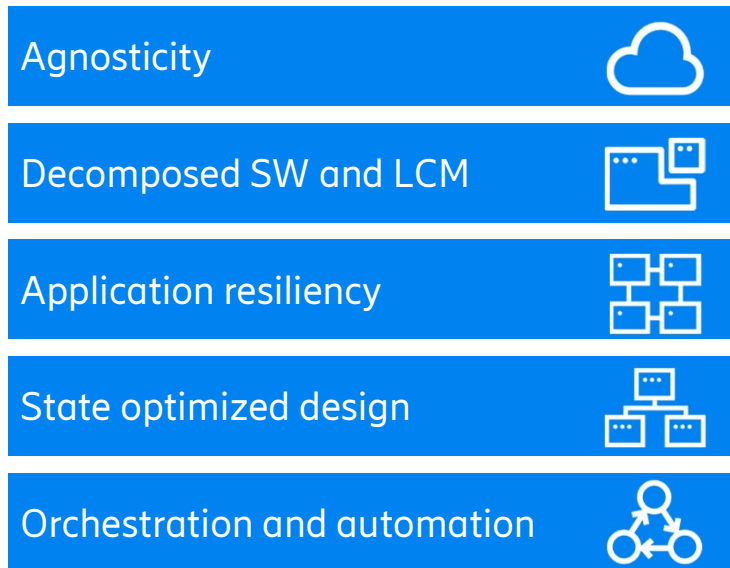
Data Center



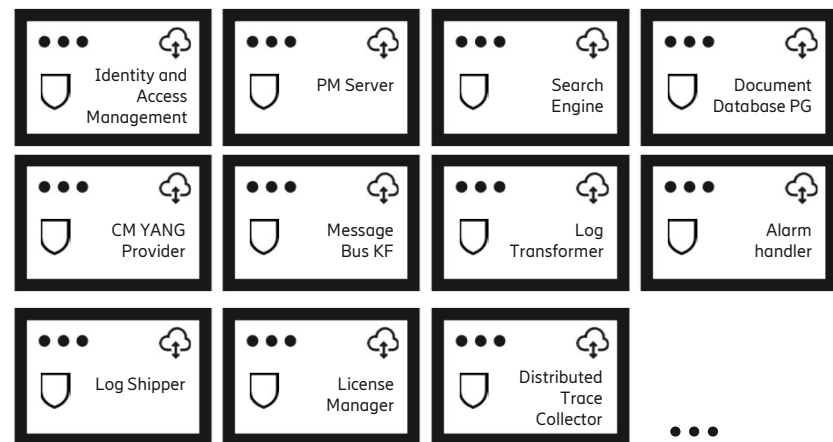
Deployment flexibility from 1000s to Millions of Devices

Cloud Native and microservice architecture

Following Cloud Native best practices:



Leveraging dozens of microservices that are common across whole Ericsson portfolio.



CI/CD with LCM of individual microservices improves software quality, minimizes risks, reduces costs and enables a faster TTM.

Learn more about Ericsson Cloud Native Applications [here](#)

Digital Services Portfolio overview

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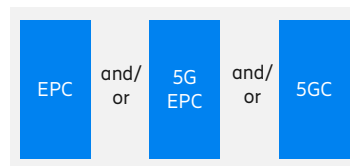
SA OSS		SA Communication Services		SA Packet Core		SA CNFV	SA BSS	Digital Fabric
Automatic Network Operations		Cloud Communication		Cloud Packet Core		Cloud Infrastructure	Digital BSS	Digital Fabric
Orchestration	Analytics & Ass..	Cloud VoLTE & EC	Mobile Switching	Cloud Packet Core	Cloud UDM and Policy	BSP 8100	BSCS	CNaaS
DO	CENX	AFG	Compact Mob. Switch.	AAT	CCDM	CEE	CBiO/DMP	EAaaS
EAI	EEA	Cloud VoLTE	CTC	Enterprise Core	CCPC	Cloud SDN	CS	eSIMSIMaaS
ECDE	EEM	Compact Core	High Cap. Mob. Switch.	EPG	CCRC	ECCD	ECM	ENaaS
EDA	ENIQ-S	CSCF	M-MGw	Massive IOT PC	CCSM	Edge NFVI	EMM	
EDR	MPS	EME	MSC-S	MSP	CUDB	HDS HW	EOC	
EO	TMA	Fast VoLTE Launch	Enterprise com.	PCC	EIR-FE	NFVi Solution	EWP	
Network Mgmt		MIO	DSE	PCG	FNR	SDI	SNMP	
ENM		MRS	ECAS	SGSN-MME	HLR-FE	SDS	Yield Optimazation	
OMBS		MTAS	ECCC	vEPC	HSS-FE	Site Solutions	Customer & Partner	
SON OM		NGIN	SES	WMG	Identity Manager		DXP	
		SBC	SNA	Cloud Netw. Exposure	IPWorks			
		SBG	VPN	CCES	UPG			
		vMRF	VUC	ECE	vSAPC			
		Cloud Signaling	Regulatory					
		ESC	LI-IMS					
		IP-STP	LMISF					

Why Ericsson Cloud Core

Regional **Connect** 

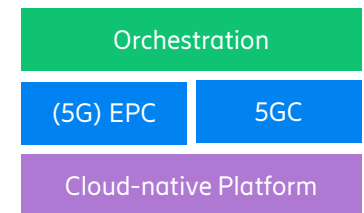
Dual mode

- One Software System for (5G) EPC & 5GC
- Flexible Deployment Models
- Simultaneous support for LTE, NR-NSA & NR-SA



Future-proof

- Cloud-native platform
- VNF lifecycle automation
- CI/CD support



Packet Core

- One common UP for EPC & 5GC
- High performance UP
- CUPS with independent UP/CP scaling
- "Any device, any access"



Unified Data Management & Policy

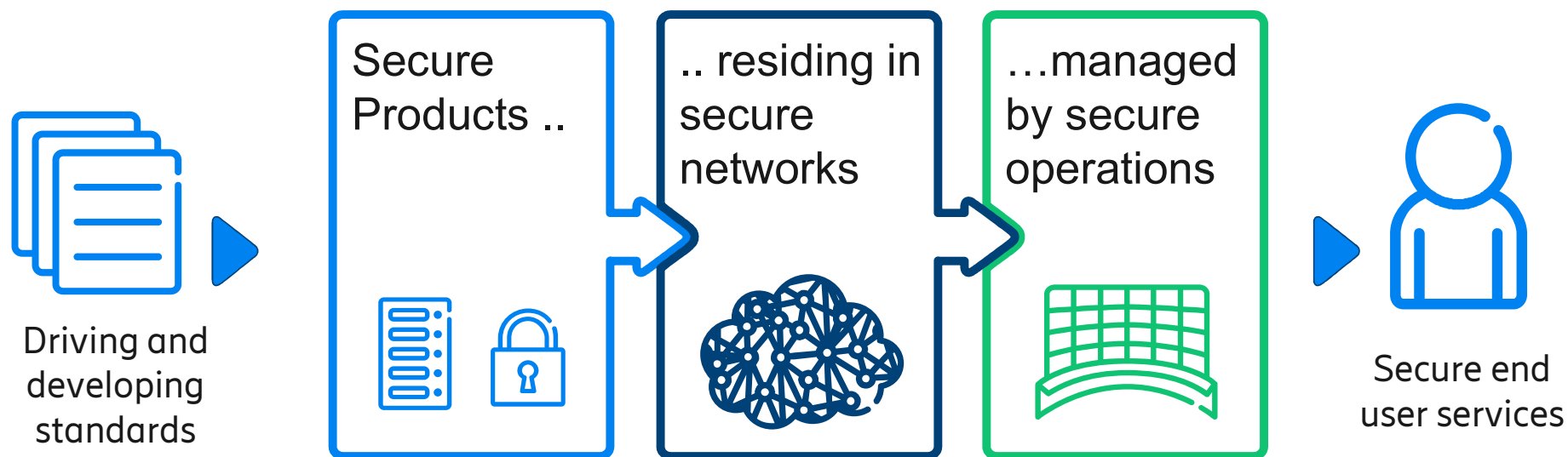
- Data storage for all access types (2G-5G)
- Policy mgmt. for users & slices
- Network exposure with flexible SBA workflows



Security In Wireless Networks

Networks must be secure by design.

Ericsson's holistic approach across technology and services ensures security that is built in from the start, across supply chain, s/w & h/w development, testing, implementation and operation.



All of our software is scanned, verified, signed and distributed centrally from Sweden, ensuring tight control over our Software Development Life Cycle and supply chain.

Security Assurance @ Ericsson

Real World Networks

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U.S. Industry Activities

- DHS ICT Supply Chain Risk Management Task Force
- Communications Sector Coordinating Council
- USTelecom, CSDE
- CTIA (CyberSecurity Working Group)
- CSRIC and ATIS groups
- NSTAC, NSIE, NTIA, NIST, DoD, FCC

Operations

- Secure operational procedures, e.g. segregation of duties, use of least privilege and logging
- **Management of security functions, vulnerability mgmt. and detection of attacks**
- Response and recovery after breach

Deployment process

- Solid network design with security and resilience in mind
- Operator specific configuration of security parameters, hardening

Vendor product development process

- Secure hardware and software components
- Secure development processes
- Version control and secure software update

Telecommunications standardization process

- Secure protocols, algorithms, storage

Ericsson is committed to ensuring the integrity of our supply chain and security of our products; risk management is a key part of our end to end lifecycle process.

Fixed Wireless Access

Yesterday

Today

Why Fixed Wireless Access now?

FWA momentum growing in every Generation; Accelerating with LTE-Advanced & 5G

Broadband demand

New spectrum

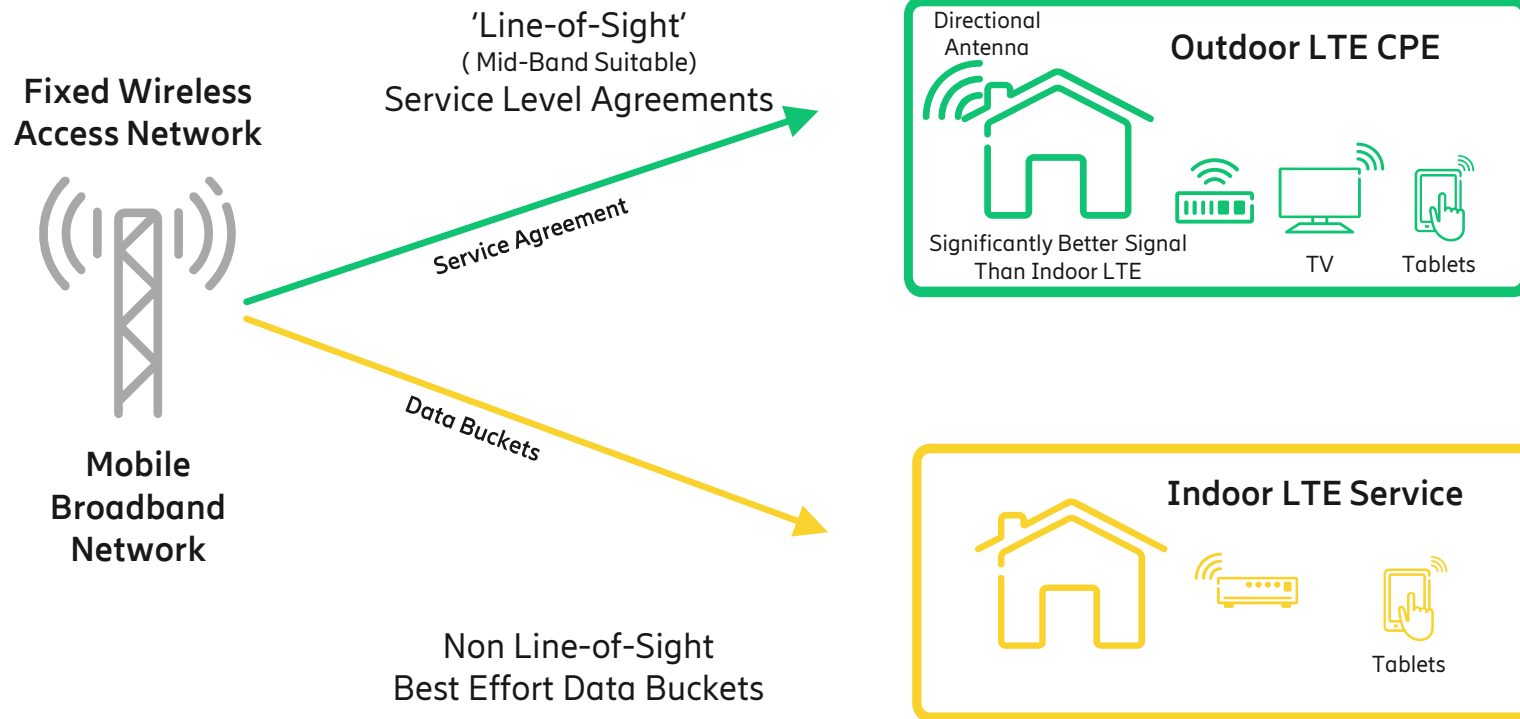
Network technology
advances

Global ecosystem

Government investment

New revenue
opportunities

Fixed wireless business models



Outdoor LTE CPE provides better business case compared to Indoor

Taking advantage of FWA opportunities

Synergies with Wireline

Regional **Connect** 

Operator opportunities

Increasing competitive pressures for broadband services up to 100Mbps

Higher deployment cost per Mbps for fiber

High wireline churn due to long upgrade deployment cycles

Generate revenue from new sources

How wireless supports

New LTE-Adv/5G technologies enable fiber-like speeds

Fixed wireless reduces the cost per home passed in most markets

Time to Deployment is faster reducing churn and decreasing Time to Revenue

Enables home/small business broadband service offerings

Time is right to take advantage of fixed wireless opportunity



www.ericsson.com/regionalconnect